

Remarks:

Applicants respectfully request reconsideration of the present application.

§103 Rejections

In the Final Office Action of September 26, 2005, claims 1-20 are rejected under 35 U.S.C. §103(c) as unpatentable based on Yang in view of Marriott et al. (Marriott). Applicants respectfully, but earnestly disagree. **To date, the Examiner has not produced a single prior art reference, or combination of references, which can fairly be said to teach or suggest gradually transitioning an engine between different shot-number operating modes.** Moreover, the requisite motivation to combine the references in the first place is altogether lacking. The rejection based on Yang and Marriott thus does not set forth a prima facie case of obviousness. It would therefore be unfair to force Applicants to undergo the delay and expense required to appeal the present Final Rejection where the references of record do not even teach or suggest all the limitations of Applicants' claims.

Applicants readily concede that Yang teaches gradually transitioning cylinder groups of an engine between different operating modes. Marriott in turn teaches injecting two fuel charges into a cylinder during a single engine cycle, and also discusses operation using a single fuel charge. These issues are not disputed. However, while Marriott might be said to disclose two distinct operating strategies, the reference does not teach a strategy with two different shot-number operating modes, and proposing to combine Marriott with Yang does nothing to remedy this defect. The Examiner's argument ignores the fact that Marriott presents dual shots as an improved strategy over single shots, not as two concurrently available approaches. Applicants' inventive insight to combine different shot-number strategies as claimed is altogether lacking in the cited references and from general knowledge in the art. In addition, the Examiner has not even properly explained how the contraption resulting from Yang and Marriott *could* be encompassed by Applicants' claims.

The combination resulting from Yang and Marriott might be a dual shot mode with Marriott-style timing, plus a carbureted mode. This is not what Applicants have claimed. If, alternatively, the single shot teaching of Marriott were imported into Yang, the resultant method might be Yang with fuel injection rather than carburetion. This is also different from what Applicants have claimed. It is only by way of Applicants' disclosure that the desirability of having both shot number modes available in the same engine becomes evident. The fact that different aspects of the claimed invention may be picked and chosen from the teachings of various references still does not provide the requisite motivation to combine those teachings, and

goes against the well established MPEP and case law standards for an obviousness determination. The Examiner's identification of different features of the claims in separate references thus does no more than attempt to fill in the lack of motivation with hindsight. Implementing the claimed approach in various methods for gradually transitioning between shot number modes is precisely what goes beyond ordinary skill in the art, and renders Applicants' claims patentable over the cited references.

Even if all the features of Applicants' claims could be identified in Yang and Marriott, which they cannot, the Examiner has not properly explained how one of ordinary skill could arrive at Applicants' claimed invention. Yang teaches carbureted, gasoline HCCI. It is well known that HCCI is a strategy for reducing NOx. Relatively greater mixing of the fuel charge with air, and relatively lower combustion temperatures result in less NOx production. The Examiner suggests that the dual shots of Marriott might provide "better timing" in Yang. However, even if timing in Yang could be improved, introducing a diffusion burn fuel injection to Yang would reduce mixing, create a hot flame front and generate more NOx. Such a modification of Yang would go against many years of conventional HCCI wisdom, namely, that to avoid NOx, diffusion burns should be abandoned. The fact that Marriott et al. decided to strike a compromise between NOx and ignition timing would do nothing to influence one of ordinary skill to make a similar compromise in Yang.

Rather, to improve timing in Yang one of ordinary skill in the art would look to variable valve timing, variable compression ratios, or any of the other conventional methods of controlling ignition timing in an HCCI engine which do not result in greater NOx output. In contrast, according to the Examiner's reasoning, to arrive at a contraption upon which Applicants' claims could read, one of skill in the art would first have to conclude that Yang has timing problems. Next, a fuel injected diesel engine strategy would have to be consulted. Discovering Marriott, one of skill in the art would then have to conclude that the dual fuel shot strategy discussed in Marriott could be implemented in Yang, and also that the distinct single fuel shot strategy discussed in Marriott's background section could be implemented in Yang. Finally, one of ordinary skill would have to conclude that both single and dual fuel shot strategies could be used as alternative strategies in Yang. At minimum, a proper obviousness rejection would explain how one of ordinary skill would decide to use both single and dual shot strategies, and also decide to increase NOx production. Rather than being obvious, the Examiner's proposal to work backward from decades of HCCI research and increase NOx production in Yang would be the *least* likely approach that one of ordinary skill could ever be motivated to take. Accordingly, the rejections to

claims 5, 6, 11, 12 and 18, which each recite operating steps wherein different numbers of fuel shots are delivered to different cylinder groups of the engine, should be withdrawn.

In addition, Applicants have submitted herewith amendments to certain of the remaining claims, incorporating subject matter similar to that presently recited in claims 5, 6, 11, 12 and 18. The Examiner's approval of the claim amendments is respectfully solicited, as only subject matter similar to that previously considered is added, and no new search would be necessary. Moreover, should an appeal be necessary, the scope of issues will be narrowed by the present proposed amendments.

§102 Rejections

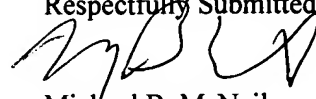
Claims 13, 15 and 16 are also rejected under 35 U.S.C. §102(e) on the basis of Gaessler et al. (Gaessler). Applicants' amendment to Claim 13 recites that the second set of fuel delivery characteristics comprises a "different number of fuel shots" wherein the number includes at least one fuel shot. Since the first set of fuel delivery characteristics set forth in claim 13 comprises a "number of fuel shots," also including at least one fuel shot, claim 13 can only fairly be read as requiring more than one fuel shot delivered via at least one of the first and second set of fuel delivery characteristics. Gaessler cannot fairly be read as teaching or suggesting more than one fuel shot. There should be no dispute that a valid §102(e) reference must teach every element of a claim, and Gaessler therefore cannot serve as a proper §102(e) reference, in view of claim 13 as now amended. Similar to the foregoing amendments discussed above, the amendment to claim 13 would add only subject matter similar to that already considered by the Examiner.

The Examiner asserts in paragraph 4 of the recent Office Action that the fuel delivery characteristics recited in claim 13 are not limited to number of fuel shots. While Applicants agree, amended claim 13 requires that each set of fuel delivery characteristics include a different number of fuel shots, even if not limited to number of fuel shots. Gaessler does not teach different sets of fuel delivery characteristics with different numbers of fuel shots, regardless of whether the fuel delivery characteristics are fuel shot number alone, or fuel shot number combined with other characteristics such as fuel volume and timing of initiation of fuel delivery.

Thus, Applicants' amendment to claim 13 overcomes the rejection based on Gaessler. The subject matter Applicants have added to claim 13 is similar to that already considered by the Examiner, and therefore is not believed to fairly require any additional search. Because the amendment also removes issues for appeal, should one be necessary, the Examiner's approval and entry of Applicants' amendment to claim 13 is respectfully solicited.

This application is believed to be in condition for allowance of claims 1-20, and in a telephone conference, the Examiner agreed that this amendment puts the application in condition for allowance. However, if the Examiner believes some additional minor clarification would place this case in even better form for allowance, the Examiner is invited to contact the undersigned attorney at (812) 333-5355.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read 'MB McNeil', written over the printed name.

Michael B. McNeil

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